Functionalized Light Robotics

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With the recent Nobel Prize in Physics partly granted to the invention and applications of optical tweezers generating tremendous impact over the last few decades, we start to see a confluence of developments that is now ripe for the emergence of a new scientific area – *Light Robotics* – which combines advances in microscopic 3D-printing, 3D light sculpting and advanced light-matter interaction and actuation [1-3]. Last year we published an Elsevier book volume [4] covering the fundamental aspects needed for Light Robotics including optical trapping, microfabrication and micro-assembly as well as underlying theoretical principles and experimental illustrations for optimizing optical forces and torques. Light Robotics is offering various novel functionalities that are enabled by these 3D designed light-driven micro-robots in addition to various nano-biophotonics applications demonstrating the unique use of biophysical tools based on light robotic concepts. We have endeavored to make this new discipline accessible to a broad audience from advanced undergraduates and graduate students to practioners and researchers not only in contemporary nano-biophotonics and nanotechnology but also to other areas of science and engineering at microscopic scales.

1) J. Glückstad, "Sculpting the object", Nature Photonics 5, 7 (2011)
2) D. Palima & J. Glückstad, "Gearing up for optical micro-robotics: synthetic microstructures actuated by optical trapping and optical manipulation", Lasers & Phot. Reviews 17, 478 (2013).
3) M. Villangca, D. Palima, A. Bañas, J. Glückstad, "Light-driven micro-tool equipped with a syringe function," Light: Science & Applications, Nature Publ. Group, 5 (9) e16148 (2016).
4) J. Glückstad & D. Palima, "Light Robotics: Structure-mediated Nanobiophotonics", Elsevier, 482 pages (2017).

Biography

Jesper Glückstad (JG) established the Programmable Phase Optics PPO.dk in Denmark almost two decades ago and currently holds a position as full Professor at the Technical Univ. of Denmark (DTU), and a position as 5-years Guest Professor in Biophotonics at Lund Institute of Technical in Sweden 2006-2011. In 2004 he received the prestigious Doctor of Science (DSc) degree from DTU for the dissertation entitled "The Generalised Phase Contrast method". Together with a colleague he has authored a 310 pages Springer book on this topic (GPC). Prior to his achievements in Denmark, JG was a visiting scientist at Hamamatsu Photonics Central Research Laboratories and in the Physics Dept. at Osaka University in Japan. Since he obtained his PhD at the Niels Bohr Institute at Copenhagen University in 1994, he has published more than 300 journal articles and international conference papers and holds over 30 international patents/applications. He has published papers in Nature Materials, Nature Methods and Nature Photonics with a recent in Nature Publishing Group (LSA). He is the year 2000 recipient of the Danish Optical Society Award and was elected as «Scientist of the Year» in 2005 by Dir. Ib Henriksen's Foundation in Denmark. JG is a 2010 elected Fellow of the OSA and a Fellow of the SPIE as the first from Denmark. In 2012-2014 he was appointed for the prestigious SPIE Fellows committee together with an American physics Nobel laurate. In 2013 & 2016 invited to join the Editorial Boards of the European Optical Society journal JEOS and De Gruyters ODPS. JG was invited Plenary Speaker at the prestigious IEEE NANO 2016 held in Sendai, Japan. Invited as nominator for the highly prestigious 50 mill. yen Kyoto Prize 2017 (also referred to as the Asian Nobel Prize). A 482 pages Elsevier book on Light Robotics – the first on the topic - was published in the Summer 2017. JG is founder of the spin-out OptoRobotix ApS OptoRobotix.com originally rooted in the Silicon Valley region in CA, USA. Also founder of the associated tech-transfer unit GPCphotonics.com.